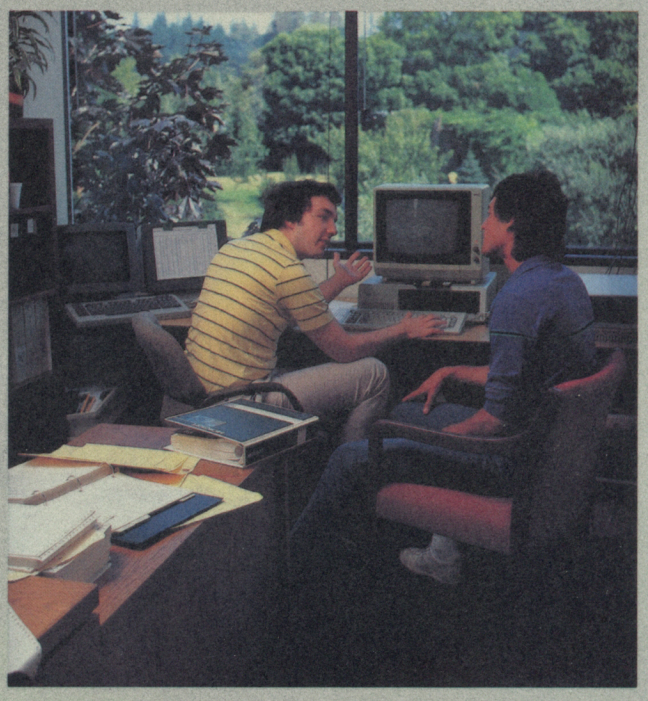
MICROSOFT

The High Performance Software



MICROSOFT®

The High Performance Software™

throughs. Our research and development team is led by enthusiastic professionals, and directed to the corporate goal of improving the quality and capabilities of software. In each development area at Microsoft, you'll have an opportunity to work closely and informally with some of the leading software authorities in the world — the people at Microsoft.

Microsoft: an outlet for your creativity and energy

At Microsoft we make things happen. We work on projects that come to fruition in the present. And our people are influencing the way software will look tomorrow.

As a Microsoft programmer, you'll have the chance to work with the latest hardware products, often before they are announced on the market. Our OEM customers value our input. As an OEM project team member, you'll have the opportunity to give your technological input for the prototypes **and** to work on the software that will run on them. We even help OEMs add hardware features to their machines which, in turn, enables us to create more powerful software for them.

The industry looks to Microsoft for innovations

Productivity Applications

The Microsoft productivity applications are a family of closely related business software tools. They share a common design objective — to allow a non-technical user to create problem-solving models without learning a computer language. Each of these products must provide a high level of performance without demanding a great deal of technical understanding on the part of the user.

The current products in the productivity application family include the Microsoft Multiplan® electronic worksheet program, Microsoft Word word processing program, Microsoft Chart complete business graphics program, Microsoft File data management program, and Microsoft Project project scheduling and costing program.

Interactive Systems

Software portability is one of the significant challenges facing the Microsoft programmer. Much of our newer software will run without modification on dozens of machines that have different operating characteristics, including different processor and display architectures, graphics support, and color. Our challenge is that such device independence must not minimize the high performance of our programs.

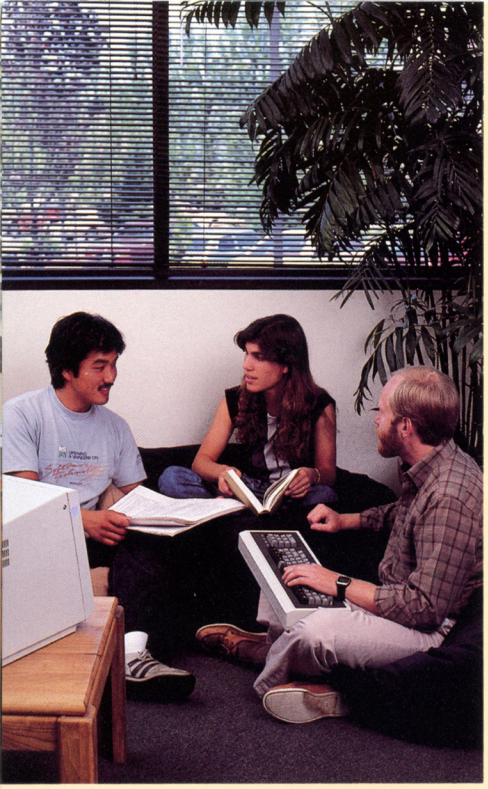
Microsoft Windows, the major product of our interactive systems group, provides computer users with a universal operating environment, regardless of which computers they use. For the software developer, Windows provides the capacity to develop sophisticated, graphics-based integrated programs that can run without modification on widely varying hardware.

Microsoft Windows will drastically improve the means by which software developers write applications. The user interface — including menu handling, icon manipulations, forms specification, and so on — will no longer need to be handled separately for each application. The application programs simply will use calls to the Windows software for the routines they need.

Operating Systems

One of Microsoft's major projects is an enhanced version of the licensed AT&T® System III UNIX® operating system for microcomputers. Called Microsoft XENIX,

"You won't be patching systems that spun out of control years ago. You'll be making a contribution in a very short time."



"Here people are concerned with your success. It's also the success of the entire company."

it is our high-level operating system for 16-bit microcomputers, which offers these powerful features:

- High portability across a wide variety of architectures
- Flexibility to handle multiple processor installations
- A versatile programming environment that includes high-level languages and program development tools
- A "software tools" architecture that emphasizes a powerful and standard inter-program interface, which allows rapid building of powerful programs from the existing base of tools.

Microsoft products include XENIX versions for the 8086, 286, and 68000 microprocessors. XENIX provides a powerful high-end multitasking and multi-user environment particularly suited to software development. Much of our future development will be aimed at providing greater compatibility with other operating systems products, for example, networking between the MS-DOS™ and XENIX operating systems.

Microsoft's MS-DOS operating system dominates the 16-bit computer field and has become the most popular piece of software in the world. We continue to update MS-DOS to provide greater functionality for the burgeoning software market, especially in the area of business applications. MS-DOS is currently being enhanced to include multitasking, virtual memory, transparent extendable networking, and protection.

Microsoft believes that the office of the future will require innovative communications software to maximize sharing resources and information. The development of a local area network system is a highly challenging project, requiring the efforts and skills of the very best: Our product must be transparent and intuitive, it must run efficiently on very small installations, and yet be architecturally designed in such a way that it can be upgraded to integrate with an eventual "world net."

Computer networks will soon become the main sources of information and communication in both the office and home environments. This project provides an opportunity to play a key role in influencing the shape and direction of the future of the computer/human relationship.

Handhelds

Working with hardware manufacturers around the world, Microsoft has pioneered the field of handheld computers. Microsoft originally developed the concept and software for the Epson HX-20, a handheld with a 4-line by 20-character display. This early machine had a limited market. But Microsoft's Kay Nishi (Vice President, New Technologies) realized that the LCD and CMOS technologies, along with innovative software, would create the opportunity for making handhelds a whole new category of computers.

Mr. Nishi worked with Microsoft engineers in both Seattle and Tokyo to develop a handheld that used an 8-line by 40-character display and that included a built-in modem, BASIC, and application software for word processing, list management, and communications. The result was the easiest computer to use on the market today — the Radio Shack Model 100. The same software and concept were used to create the Olivetti M10 and the NEC PC8201. Over 80 percent of the handhelds sold today are one of these three models.

Handheld projects blend Microsoft's vision of hardware advancement with both its systems and application software expertise. Today Microsoft is developing the next generation of handhelds. A small, elite team of Microsoft engineers is designing and developing the new 16-bit software. Six developers will define the software that will eventually be used in hundreds of thousands of machines.

Advanced Language Technology

We are developing state-of-the-art compiler and interpreter technology at Microsoft. As new microprocessors are introduced, we are the ones who work on new language processors to run on them. The Microsoft language family is highly integrated with compiler front ends for BASIC, C, FORTRAN, and Pascal that share a common intermediate language used by our code generators. The compilers use advanced optimization techniques such as common subexpression elimination, flow analysis, and peephole optimization. Our languages working together with the operating system and user interfaces present a unique challenge in providing tomorrow's professional workstation environment.

Complementary interpreters, symbolic debuggers, assemblers, and linkers are being developed for our languages to complete our microprocessor based programmer's development environment.

Our Microsoft compilers now include BASIC, C, COBOL, FORTRAN, and Pascal for the 8080, 8086, 286, Z8000, and 68000 processors. Development will be starting soon on the next generation of 32-bit microprocessors.

Hardware and Peripherals

On the leading edge of hardware and associated software technology, the Hardware and Peripherals Division is planning, designing, and producing peripherals to complement the industry's leading computers. Products range from expansion cards to stand-alone peripherals.

Microsoft is exploring and implementing technologies in the fields of semiconductor design, graphics, networking, and communications. Our goal is to create unique products, using state-of-the-art hardware with the most advanced software.

Microsoft maintains its dominant role in the software industry by staying on the cutting edge of product advancement by anticipating the software needs of the future and the development challenges that software companies must meet. Opportunities are broad and far-reaching for our programmers.

As the demand for software continues to escalate, it becomes essential for any software package to be available for many different computers. Instead of writing programs for one specific machine, Microsoft programmers are creating software that runs on a dozen or more computers.

Ours is a "software is our business" environment. Microsoft was founded by and is run by system software developers who understand your needs. We offer:

- Participation on a small development team
- Responsibility for some projects on a one-task/one-person basis
- The chance to learn from leading software professionals
- Personal satisfaction and professional recognition
- The opportunity to be part of a growing company that is the force in microcomputer software

Microsoft products go places. They're used by millions of people around the world. Your work here can have high visibility and real impact on the microcomputer software industry.

"There's always a new product or machine. If you're willing to work and find a niche, you can learn everything there is to know."

"The only limit to how fast you can rise is how willing you are to work and take on responsibility."

HERE IS A TYPICAL PROGRAMMING ASSIGNMENT YOU COULD ENCOUNTER AT MICROSOFT

How would you handle it?

The requirements of portability create interesting situations where theoretical and practical problems appear together. A portable program by definition is one that does not depend on a particular machine architecture. This raises the following paradox:

If the code does not depend on an architecture, how can it exploit special capabilities efficiently? Clearly, a special capability must be treated with special code that is not transportable. The challenge then is to keep as much of the program logic in the portable — or "abstract" — portion as possible but still provide an information-rich environment for the machine-specific portion so that it can work efficiently.

An example for this is a debugger for an intermediate language interpreter, such as one that might be used for Pascal. An optimal debugger should have the following properties:

1. No interference with the environment of the program being debugged (subject program).
2. Ability to inspect and alter the complete state of the subject.
3. The ability to interact with the subject program at a high repetition rate; for example: for tracing, conditional breakpoints, or performance measurements.

The implementation of the optimal debugger requires independent processes that can co-reside in the central memory using some sort of hardware address mapping. None of today's popular micros can do this. The engineering solution to the original problem retreats from the optimum to accommodate the reality of various hardware architectures.

A system which dumps the complete machine state on backing storage at every call to the debugger will generally satisfy (1) but go against (3).

On the other hand, a debugger sharing address space with the subject program will seriously interfere with the available space while satisfying condition (3).

The relative merits of the different tradeoffs depend not only on the available hardware (speed and size of backing store, size of address space) but also on the phase of program development; initially there will be many bugs to be found, even with simpler test input. In later stages of development, performance measurements will be important. During program maintenance, the ability to recreate problems that may occur under fully-stressed operation conditions becomes most important.

In this example, the key to portability is the design of the interface used by the debugger to inspect and alter the subject program and the method of transfer of control.

With the proper definition, the "nonportable" portion will be relatively small compared with the debugger proper that includes the user interface and language specific knowledge. If the interface is able to express some specific information about the semantics of a control transfer (e.g., continue while location 1202 does not equal 0), new compromise solutions in addition to the two extremes described above also may be obtained.

In conclusion, portability considerations force us to partition the problem into logical modules that "hide" machine or implementation-specific details. Different configurations of the modules can be useful even within a single system to overcome different limitations for different applications.

What are your ideas concerning debuggers? How would you define the interface between the debugger and the subject program? Write to us with your thoughts about this problem and we will share our ideas with you.

Send your comments to Jo Ann Rahal, Microsoft Corporation, 10700 Northup Way, Box 97200, Bellevue, WA 98009.

KEY EVENTS IN MICROSOFT'S HISTORY

Microsoft has come a long way since it was founded in 1974 as a two-person operation with one product. It has become a growth-oriented company with a rapidly expanding product line.

There is a coherency of direction at Microsoft — company-wide — from development of new products to support of these products. We decide which products we want to pursue technically, we design and implement them in a professional manner, and then we market our software to microcomputer users around the world.

February 1975—
Microsoft BASIC completed and sold to Microsoft's first customer, MITS, manufacturer of the ALTAIR personal computer.

July 1977—
Microsoft began selling its second language product, Microsoft FORTRAN.

Fall 1978—
Microsoft began selling its third language product, Microsoft COBOL. Microsoft BASIC licensed to Radio Shack and Apple Computer, Inc. Microsoft initiated sales to Japan.

February 1980—
Microsoft licensed the UNIX™ operating system (Bell Labs) and formed the XENIX group.

August 1980—
Microsoft introduced SoftCard®, a software/hardware enhancement product for the Apple II. Sales topped 60,000 during its first two years of availability.

August 1981—
IBM introduced its Personal Computer, which uses Microsoft's MS-DOS™ 16-bit operating system plus Microsoft BASIC, Microsoft COBOL, Microsoft Pascal, and other Microsoft products.

Spring 1982—
Microsoft introduced GW™-BASIC, which combines software support for advanced graphics and other extended capabilities with the industry standard Microsoft BASIC.

April 1982—
Microsoft opened a European sales and marketing office.

August 1982—
Microsoft began shipping Microsoft Multiplan® electronic worksheet, the first product from the Application Software Group.

November 1982—
The number of MS-DOS installations rose rapidly as 50 microcomputer manufacturers licensed the 16-bit operating system from Microsoft during its first 16 months of availability.

Spring 1983—
Microsoft released several 16-bit languages to run on MS-DOS including Microsoft BASIC, Microsoft BASIC Compiler, Microsoft COBOL, Microsoft FORTRAN, Microsoft Pascal, and Microsoft C Compiler.

Spring 1983—
Microsoft introduced a low-cost, handheld pointing device called the Microsoft Mouse.

October 1983—
Microsoft formed a trade book publishing division, Microsoft Press, and signed an agreement with Simon and Schuster to manufacture and distribute the books.

October 1983—
Microsoft introduced its full-featured word processing program, Microsoft Word.

November 1983—
Microsoft introduced Microsoft Windows, an extension to the MS-DOS operating system that provides a universal operating environment for developing bit-mapped application programs. Microsoft Windows was introduced with the support of 23 microcomputer hardware manufacturers and several leading software application developers.

January 1984—
Microsoft took a leading role in developing software for the Apple® Macintosh™ computer. The company shipped Microsoft BASIC and Microsoft Multiplan for the Macintosh simultaneously with the January introduction of Macintosh.

April 1984—
Microsoft created a new Hardware and Peripherals Division to develop and market hardware products that complement its software product line.

May 1984—
Microsoft introduced Microsoft Project, a project scheduling and resource allocation program.

May 1984—
Microsoft introduced XENIX® operating system support packages for two 32-bit microprocessors, the Motorola 68000, and the Intel 286.

Spring 1984—
Microsoft's operations in Japan saw the continued development and acceptance of MSX®, a Microsoft developed 8-bit hardware/software specification. MSX machines are now available in Japan from 14 different manufacturers. Microsoft began shipping MSX-DOS, a disk-based operating system for MSX machines.

July 1984—
Number of MS-DOS installations continues to increase as 200 microcomputer manufacturers have now licensed the 16-bit operating system.

August 1984—
Microsoft introduced Microsoft Chart, its business graphics program for the IBM® PC, PC XT, Portable PC, COMPAQ®, and Apple Macintosh computers.

Fall 1984—
Microsoft introduced Microsoft File and Microsoft Word for the Apple Macintosh computer.

"You're working for programmers — who really understand the job and the people."

Bill Gates—Chairman of the Board

"Our goal is to make a lasting contribution. The key to that is great people."

WE WANT THE BEST PEOPLE AT MICROSOFT

Integral to our success are our people. Key roles are played by our programmers. We are not merely looking for good programmers . . . we need exceptional systems design programmers.

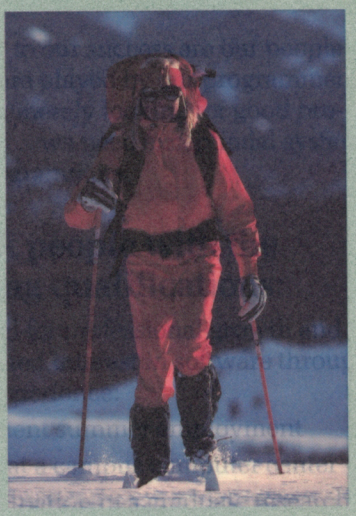
We seek people with the following qualifications:

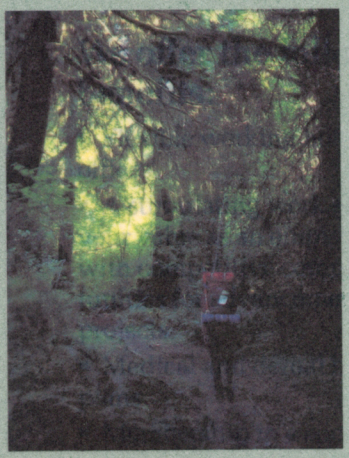
- Potential for professional growth and a demonstrated interest in software through relevant experience:
  - pertinent summer employment
  - work at a campus computer center
  - participation in a graduate research program
  - other employment as a working professional
- A well established base of technical knowledge
- Personal attributes such as self-drive, initiative, enthusiasm, and the ability to work independently as well as part of a team

We offer the following benefits:

- Flexible working hours and private offices
- A stimulating work environment where your value as an employee is recognized with competitive compensation, opportunities for advancement, and challenging projects
- Medical and dental health/life insurance plans
- Membership in a sports health and racquet club facility

PACIFIC NORTHWEST LIFESTYLE





Microsoft is located in Bellevue, Washington, an area that's perfect for enjoying all the benefits of the Pacific Northwest.

Fifteen minutes and one floating bridge away from Microsoft is downtown Seattle, hub of the region's major sports, cultural, and commercial activities. You will find looming skyscrapers meeting old Seattle by the shores of Elliott Bay, with winding, narrow streets, and an atmosphere that will transport you back to the hearty fishing village of yesteryear.

Outdoor environments — ranging from mountains, ocean beaches, deserts, rain forests, freshwater lakes, and rivers — are within easy reach. People enjoy the out-of-doors year 'round in the Northwest. A two-hour drive and the Pacific Ocean is where you'll discover driftwood-covered sandy beaches, alive with the sounds of migratory birds, gulls and terns, and sightings of passing whales and porpoises. Closer in, people dig clams, pick up oysters on the rocky beaches of Hood Canal, and set pots for Dungeness crab.

Numerous freshwater lakes and rivers are also near, for some of the best fishing, boating and swimming in the United States. There are rain forests, where the land is engulfed in shimmering greenery and filled with the sound of wildlife. Off in the distance, you'll spot one of the area's magnificent mountains, Mt. Rainier, 14,410 feet above sea level, criss-crossed with trails for skiers and hikers. Snow skiers flock to neighboring passes — Snoqualmie, Stevens, and White — from November through March, day and night, for cross-country and downhill skiing.

The Seattle area has become the home for individualists from all parts of the United States and many foreign countries. It's known for its friendly atmosphere and admired for its clean air and beauty. People here are those who enjoy life and who want to live in an area where they don't have to surrender their quality of life in order to enjoy a challenging career.

Come join us in the heart of the Northwest. Come explore the opportunities.

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The High Performance Software™

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